

## National Research Center for Translational Medicine · Shanghai—— National Key Scientific Infrastructure for Translational Medicine

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In July 2013, the National Development and Reform Commission formally approved the “National Research Center for Translational Medicine · Shanghai” (hereinafter “the Center”), a piece of the national key scientific infrastructure. As a national-level institution, the Center will be co-administered by the Ministry of Education and the Shanghai Municipal Government. While affiliated with Shanghai Jiao Tong University (SJTU), the Center will also integrate the biomedical forces of universities and scientific institutions in Shanghai, including Fudan University, Tongji University, Shanghai Institutes for Biological Sciences, and the Chinese Academy of Sciences. It will also closely collaborate with industries, with a goal of developing into a multidisciplinary, open and internationally influential base for translational medical research. This key scientific infrastructure will also be supported in terms of running costs and research personnel by the Collaborative Innovation Center for Systems Biomedicine of the Ministry of Education, which is being established. Professor Sai-Juan Chen, a member of the Chinese Academy of Engineering, has been appointed as Director of the Center.

### BACKGROUND

With the rapid development of the social economy and the emergence of new challenges to health including environmental deterioration, aging and change of lifestyles, China is facing challenges in a complex disease spectrum charac-

teristic of both developing and developed countries. While communicable diseases remain a heavy burden, chronic non-communicable diseases, such as cancer, cardiovascular and cerebrovascular diseases and diabetes, have already become the leading causes of morbidity and mortality. Meanwhile, the healthcare system of the world’s most populated country is under the dual pressure of limited medical resources and constantly increasing needs for medical services. The quality of medical services must be improved while expenses be controlled. Furthermore, as in many countries, there are disjunctions between basic sciences and drug research and development, and between clinical trials and public health. To this end, the development of translational medicine represents both a necessity and an opportunity for China.

The concept of translational research was pioneered by National Institutes of Health of US. It usually refers to efforts directed toward converting basic biomedical research discoveries into effective new therapies and bringing clinical observations back to the laboratory. In view of China’s national conditions, we have a unique understanding of translational research, which, in our view has a wider connotation than “from bench to bedside”. While clinical application is stressed to benefit patients, preventive medicine to benefit the general population should also be emphasized. Medical research should extend from bench to public and community, look for effective measures for disease prevention and control through epidemiologic studies for community intervention, and provide evidence for public health policy-making.

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SJTU and Rui-Jin Hospital are the two major supporting institutions of the Center. Both have sound foundations for translational research. SJTU is one of the top universities in the country. In July 2005, SJTU and Shanghai Second Medical University merged to form the new SJTU, jointly supported by the Shanghai Municipal Government and the Ministry of Education. The merge has promoted the interactions of engineering, science and medicine, laying a solid foundation for translational research. Rui-Jin Hospital, where the clinical research building of the Center will be located, is a renowned general hospital with the rank of “Grade 3, Class A” (the highest level in China). In the past 60 years, SJTU School of Medicine and Rui-Jin Hospital have made major contributions to the medical sciences in China and the world, including the successful treatment of patients with extensive burns led by Dr. Ji-Xiang Shi in the 1950s and the first successful case of limb re-implantation in the world by Dr. Zhong-Wei Chen in the 1960s. In recent years, the novel and curative synergistic targeting therapy of acute promyelocytic leukemia, pioneered by the research team led by Prof. Zhen-Yi Wang, Prof. Zhu Chen and Prof. Sai-Juan Chen at Shanghai Institute of Hematology of Rui-Jin Hospital, has been widely recognized as a paradigm for translational research in the world. Rui-Jin Hospital has also made important achievements in the studies of metabolic, cardiovascular and cerebrovascular diseases. Bio-banks of samples from 450,000 cases of metabolic diseases and essential hypertension special phenotypic study cohorts have been set up.

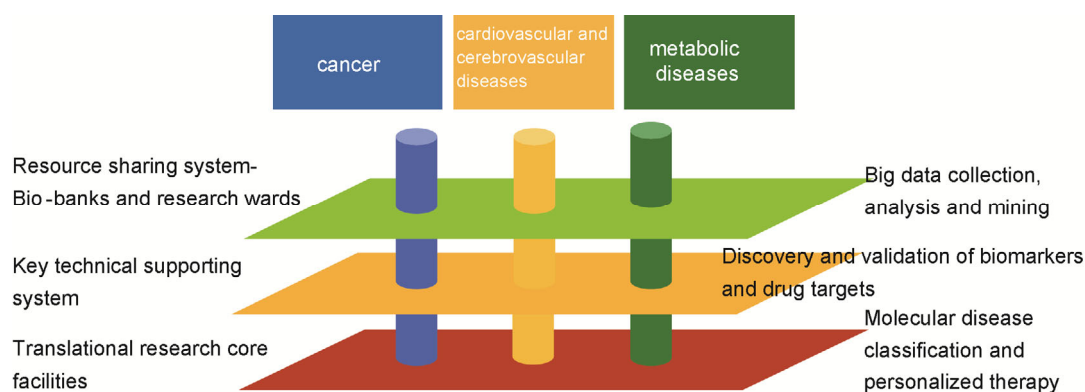
## RESEARCH ORIENTATIONS

The Center has adopted a “systematic three by three” research scheme (Figure 1). Guided by the National Innovation Strategies and National Mid- and Long-Term Guidelines for Scientific Development, and based on the advantages of SJTU and Rui-Jin Hospital, the research of the Center will be focused on three major types of life-threatening diseases: cancer, cardiovascular and cerebrovascular diseases, and metabolic diseases. To carry out

the research, the Center will prioritize building three main platforms: translational research core facilities, a resource sharing system, and a key technical supporting system. The priorities of the translational research core facilities will be given to research wards and a pathological study platform, which are crucial for the development of 4P (predictive, preventive, personalized and participatory) medicine. This will aim to improve clinical studies in China and develop standardized diagnosis and treatment protocols that keep to the norms of good clinical practice. The resource-sharing system includes standardized bio-banks (clinical cases and cohort studies), platforms for in-depth development and utilization of clinical resources, and comprehensive bio-information systems, providing and sharing valuable clinical (cohort) samples and relevant information for researchers. Modern bioinformatics and biological statistics will be used to analyze data from clinical and basic research, explore and discover the hidden biomedical rules, and provide one-stop information resource-sharing and analysis for clinical and basic researchers. The key technical supporting system includes a discovery and validation platform for biological markers and drug targets, a “pre-trial” platform for new drugs and diagnostic reagents, an exploitation platform for combined targeting therapeutics, and a development platform of new medical instruments, joint research laboratories and collaborative innovation laboratories. After discovery, validation and pre-trial through the above platforms, the novel biomarkers, drug targets, the innovative technologies and products will be applied back to the research wards. The Center aims to develop a set of intelligent portable diagnostic equipment, and achieve breakthroughs in 1–2 technologically sophisticated medical equipment. Through the above research scheme, a great number of novel methods, drugs, reagents, instruments and technologies important to the early diagnosis, treatment and prevention of the three types of diseases will be developed.

## PILOT MANAGING SYSTEMS

As the first national center on translational medicine, the



**Figure 1** (Color online) Systematic three by three research scheme of the Center.

Center aims at not only taking the lead in research but also serving as a model in exploring innovative management systems to promote the development of translational research in China.

## ORGANIZATION STRUCTURE

The Center, as a part of the national key scientific infrastructure, is autonomous in its management. In the meantime, it is established as a new research institute of SJTU. The Director supervises the general administration of the Center under the leadership of the Board of Directors. For research, an accountability system of chief scientists has been established. A series of specialized committees has been set up, including a Scientific Advisory Board, International Consulting Committee and Ethics Committee (Figure 2). Funds for regular running of the Center will be provided through national, municipal and university channels.

## RUNNING SYSTEMS OF RESEARCH WARDS

The Center plans to develop 300 research wards meeting international standards. This is the first attempt in China. With the rich clinical resources of Rui-Jin Hospital, the development of such a large scale research wards will undoubtedly enhance the core competitiveness of the Center and endows the Center with much appeal for the researchers.

Clinical trials must be approved by the Ethics Committee of the Center. A research team of qualified doctors and nurses will be formed to carry out clinical trials with quality and efficiency. All participants in the clinical trials will be free of charge in principle. The costs will be mainly covered by medical insurances, and in the meantime will be partially supported by the Shanghai Guangci Translational Medical

Research Development Foundation which was established in 2014 with a specific mission to support the translational research in China.

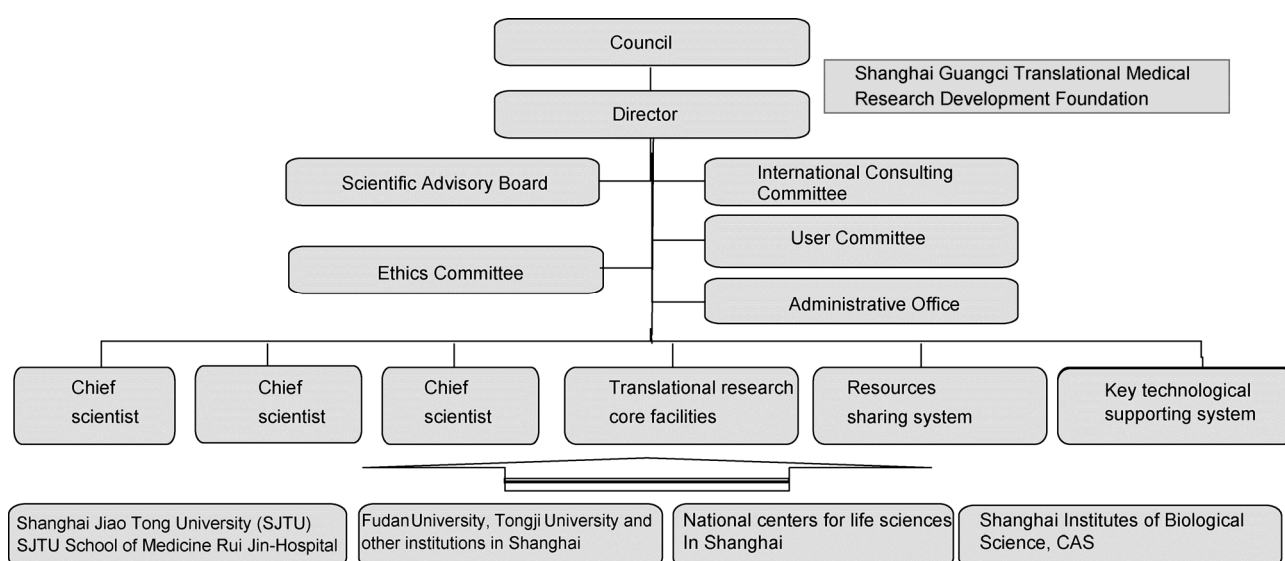
## TALENT RECRUITMENT AND ASSESSMENT SYSTEMS

Positions of chief scientists at the Center are open to high-caliber researchers from China and abroad. Preference will be given to those with a strong background and successful experiences in both clinical and basic studies or those having expertise in multidisciplinary research. A search committee composed in part of the Scientific Advisory Board and International Consulting Committee members has been formed. Appropriate criteria will be adopted for the evaluation of different types of researchers. In addition to the traditional publication-based criteria, importance will be attached to the transfer and application of the laboratory discoveries.

Following the talent-oriented concept, the Center will strive to create appealing conditions for the talents. Competitive salary and benefits depending on candidate's qualifications will be provided, with the support from national, municipal and university channels.

## FIVE-YEAR GOALS

The Center aims to discover and validate series of molecular biomarkers and drug targets in the three major disease areas, acquire numerous domestic and international patents and new drug certificates, publish several papers in top international journals, develop two or three new drugs or new treatment protocols and launch clinical trials, strive for new breakthroughs in synergistic targeted therapies for hematological malignancies beyond acute promyelocytic leukemia,



**Figure 2** Organization structure of the Center.

and develop a series of cutting-edge diagnostic and treatment instruments with intellectual property rights. In addition, the Center will endeavor to build a world-class research team composed of 10–12 chief scientists and 50 principal investigators.

## PERSPECTIVES

Significantly, the Center will promote the organic integration of advantageous scientific resources in Shanghai and

exert a profound influence in the whole country. It will accelerate the development of innovative medical systems and boost the pharmaceutical industry in China. It will also promote industry-university-institution cooperation and thus contribute to the transformation of development models of the pharmaceutical industry in China. Additionally, it will help to reinforce the interactions of different disciplines. Meanwhile, the Center will serve as an incubator for culturing world-class talent in the field of translational medicine.

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